7.8 notes

Complex Numbers

Imaginary Unit (pg. 486 – 487)
The imaginary unit, written *i*, is the number whose square is -1.
That is $i^2 = -1 \text{ and } i = \sqrt{-1}$

Examples:
$\sqrt{-7} = \sqrt{-1 \cdot 7} = \sqrt{-1} \cdot \sqrt{7} = i\sqrt{7} \text{ or } \sqrt{7}i$

$\sqrt{-16}$ $-\sqrt{-13}$ $-\sqrt{-50}$

Imaginary Numbers (pg. 487):
An imaginary number is any number that can be written in the form *a* + *bi*, where *a* and *b* are real numbers and $b \neq 0$.

Complex numbers (pg. 487)
A complex number is a number that can be written in the form *a* + *bi where a* and *b* are real numbers. (*a* and *b* both can be 0.) The real number *a* is the real part of the complex number. The real number *b* is the imaginary part. *a* + *bi* is the standard form of a complex number

Sum (pg. 488): (*a* + *bi*) + (*c* + *di*) = (*a* + *c*) + (*bi* + *di*) **Difference:** (*a* + *bi*) - (*c* + *di*) = (*a* - *c*) + (*bi* - *di*)
Examples:
(8 + 6*i*) + (3 + 2*i*) (4 + 5*i*) – (6 - 3*i*)

Multiply (pg. 488 - 489): to multiply square roots of negative real numbers, we first express them in terms of *i*, then multiply.
Examples:
$\sqrt{-4} \cdot \sqrt{-25}$ $\sqrt{-5} \cdot \sqrt{-7}$ $-3i \cdot 8i$

$-4i(3-5i)$ $(1+2i)(4+3i)$

Conjugate of a Complex Number (pg. 489 – 490)
The conjugate of a complex number *a* + *bi* is *a* – *bi*. The complex numbers (*a* + *bi*) and (*a* – *bi*) are called complex conjugates of each other, and (*a* + *bi*) (*a* – *bi*) = $a^2 + b^2$

Examples:
Find the conjugate of each number: *-3 - 7i* *4i*
Multiply: *(5 + 7i) (5 – 7i)*
Divide and simplify to the form *a* + *bi*

$\frac{-2+9i}{1-3i}$ $\frac{7+4i}{5i}$

Powers of I (pg. 491)

$i^2 = -1$ $i^3 = -i$ $i^4 = 1$

Simplify: i^{18} i^{29} i^{75}